Data Preparation, Catch History Correction, and CPUE Standardization for Stock Assessments for Pelagic Fishes

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Stock Assessment Program

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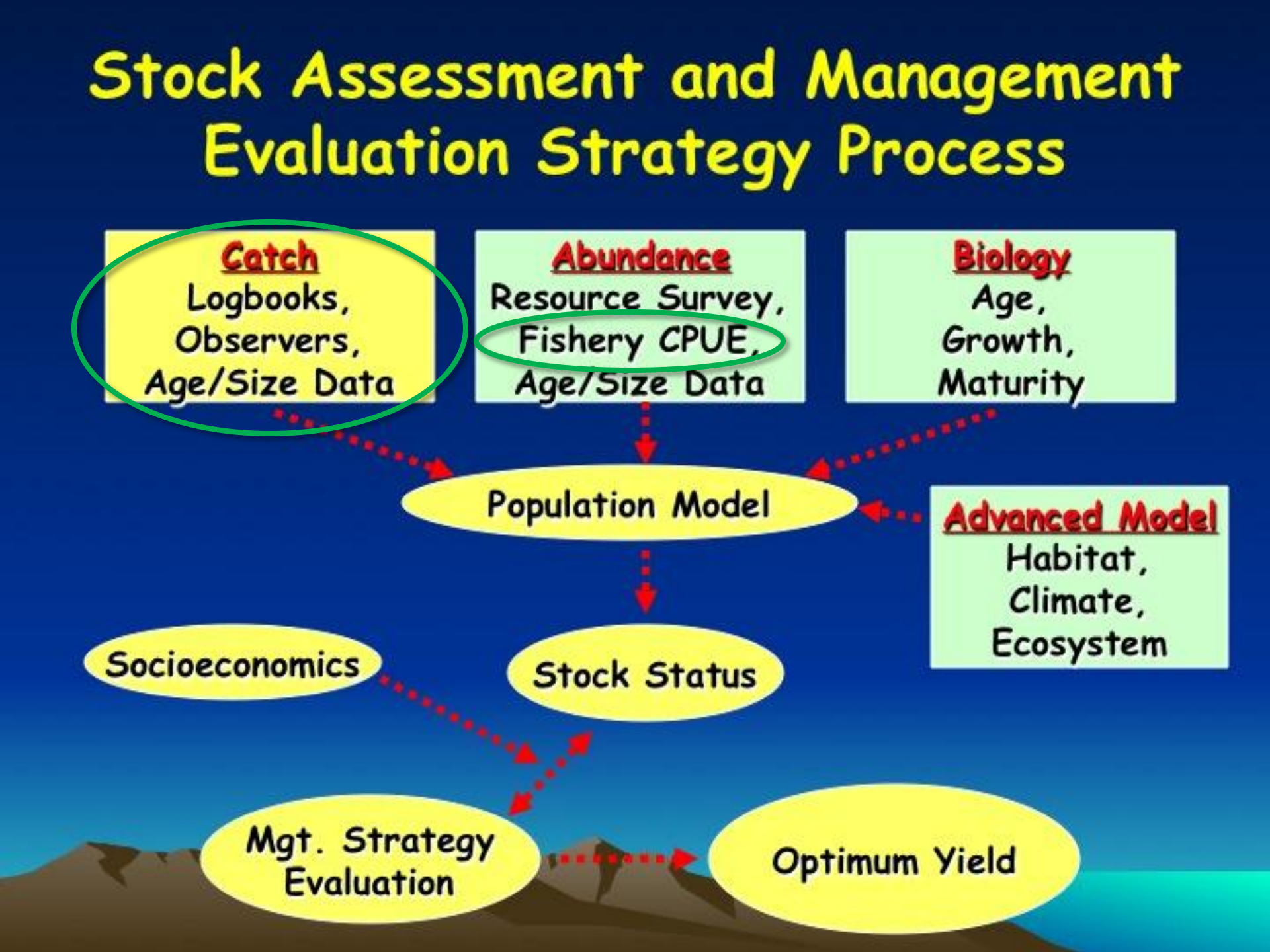
Stock Assessment and Management Evaluation Strategy Process



Background: SAP Data Use for Assessments

The SAP uses "corrected" catch data for stock assessments

- Corrected catch = Observed catch + Accepted logbook catch + Logbook catch corrections + Logbook releases corrections

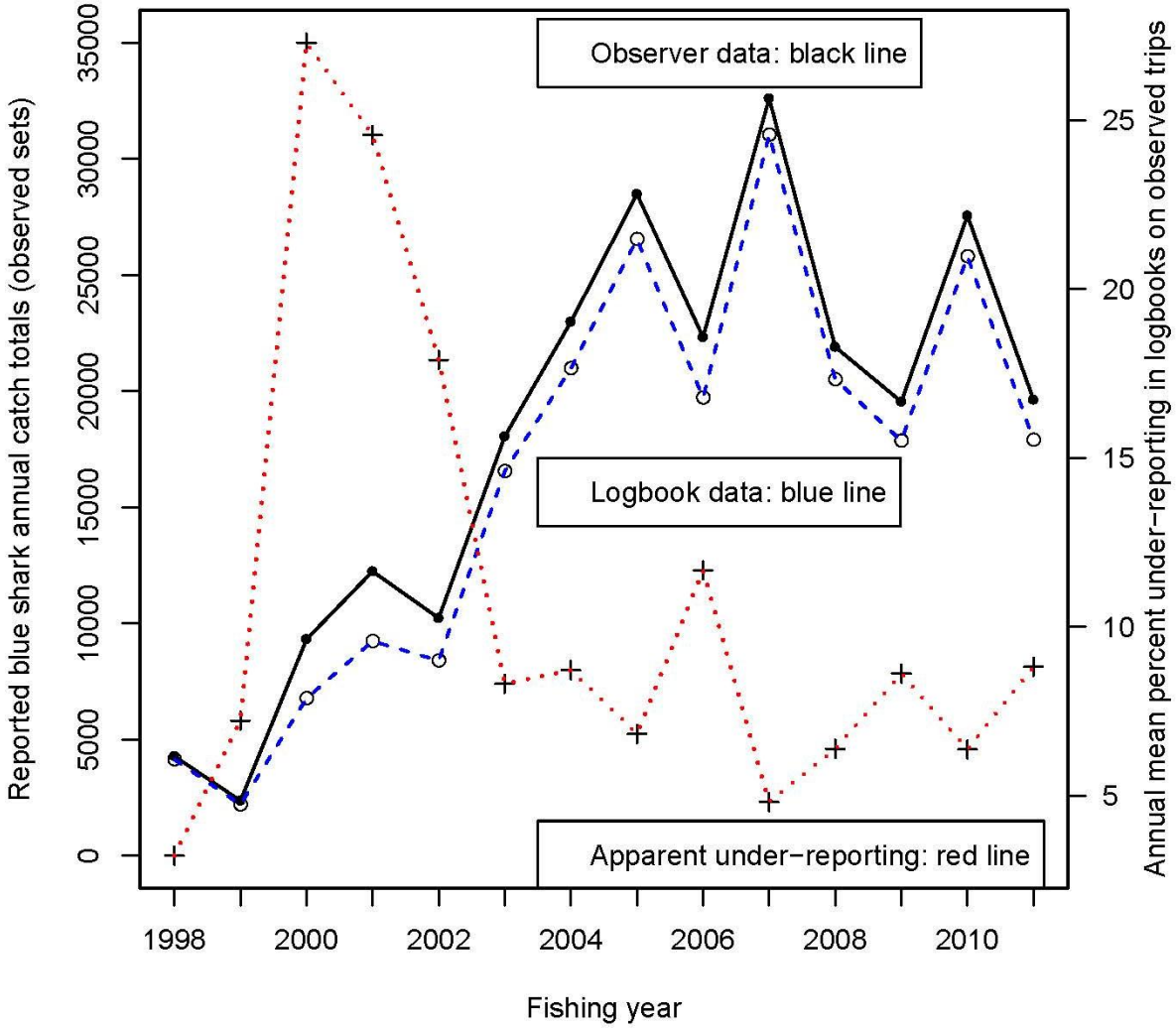
Bycatch species (e.g., sharks)

- Logbook catch corrections: statistical model estimates
- Logbook releases corrections: PIROP observers' rates

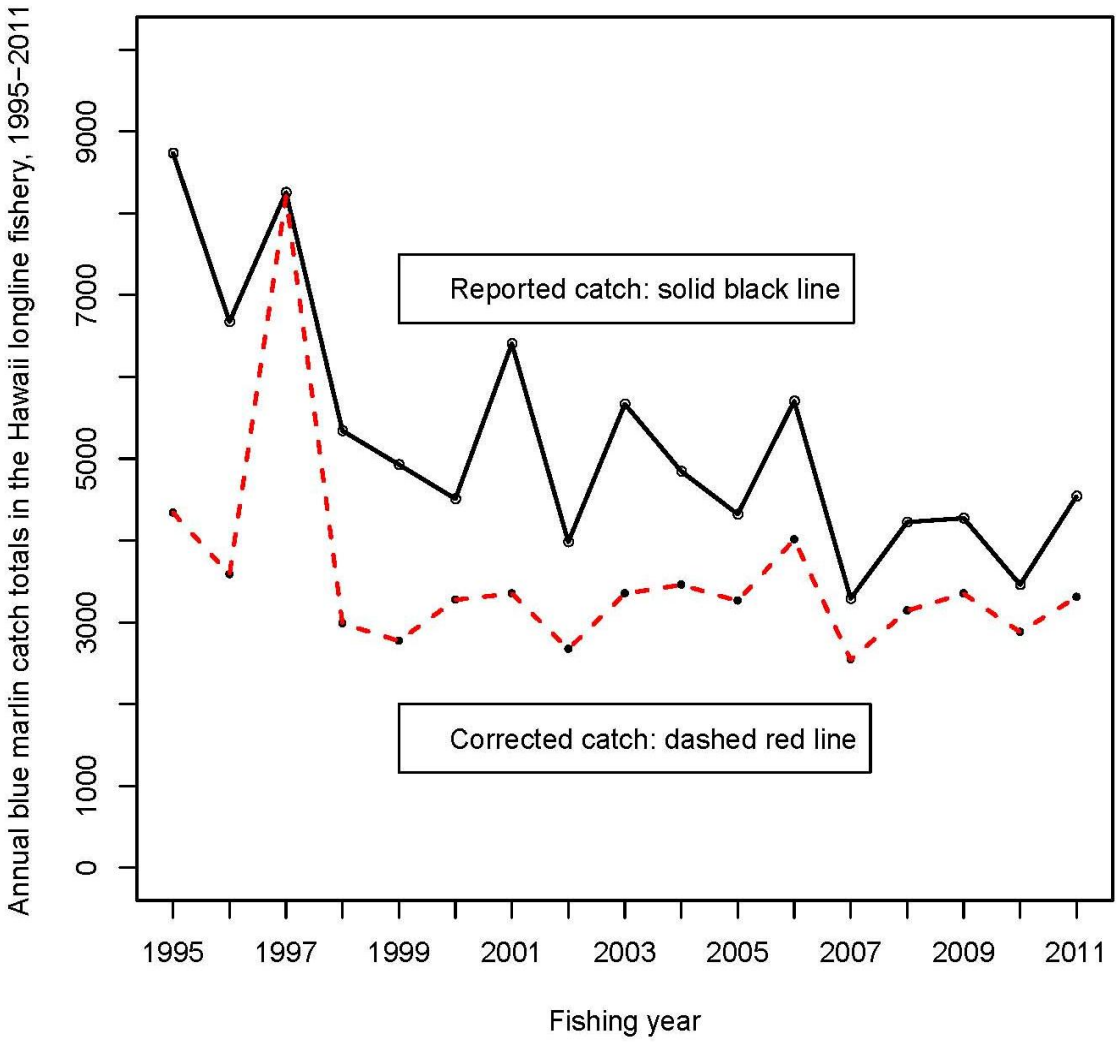
Incidentally caught species (e.g., istiophorid billfishes):

- Logbook catch errors: identified by statistical model
- Logbook catch corrections: verified with sales records
- Logbook releases corrections: PIROP observers' rates

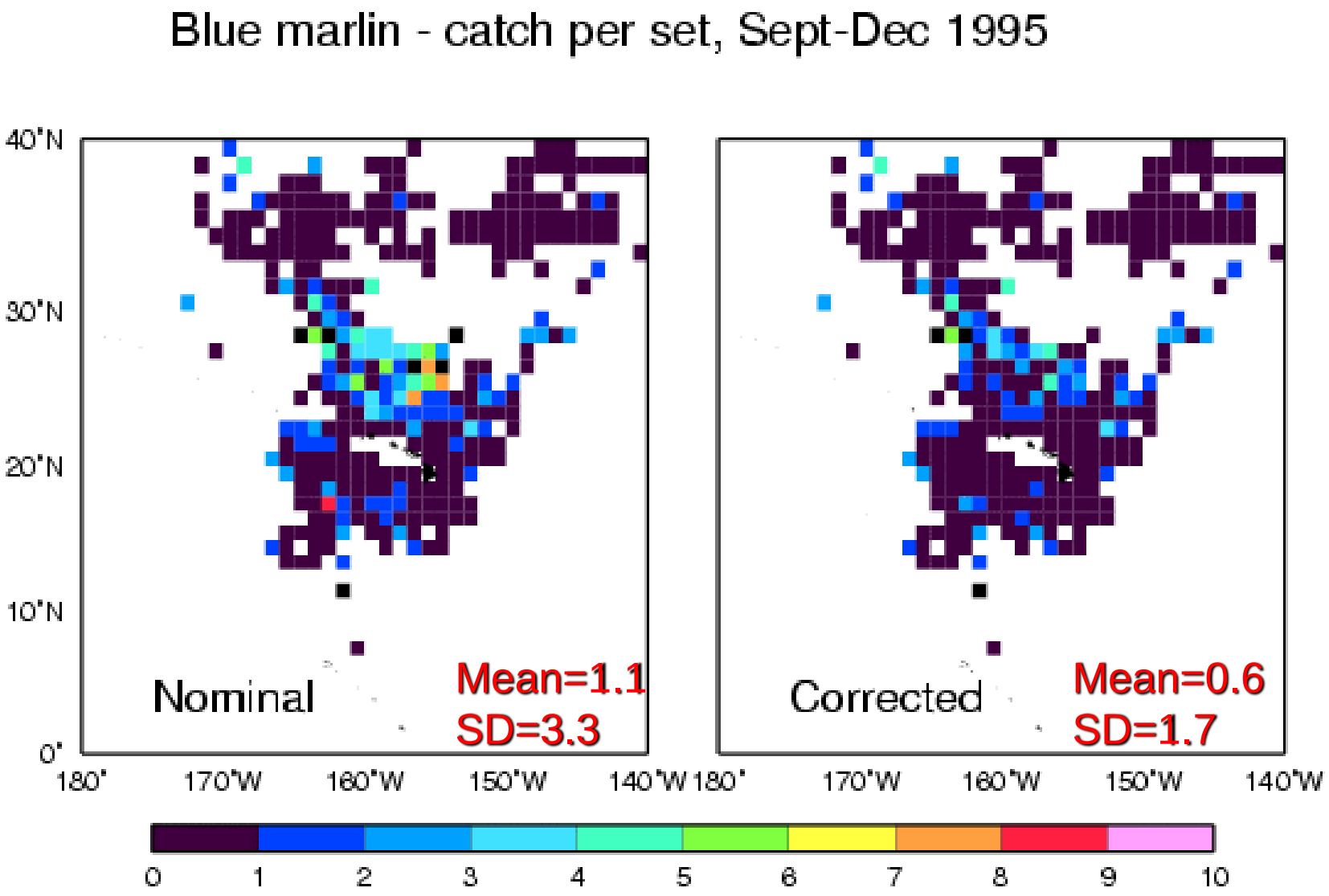
Major Problem with Catch Data: Under-Reporting Shark Catches in Logbooks



Major Problem with Catch Data: Misidentifications of Istiophorid Billfishes



Blue marlin: mean catch per set in 1°squares, September-December 1995



Catch History Correction: Integrated use of multiple data sets

Observer catch data (response)

&

Observer operational & environmental data (predictors)

→ Statistical model fitting

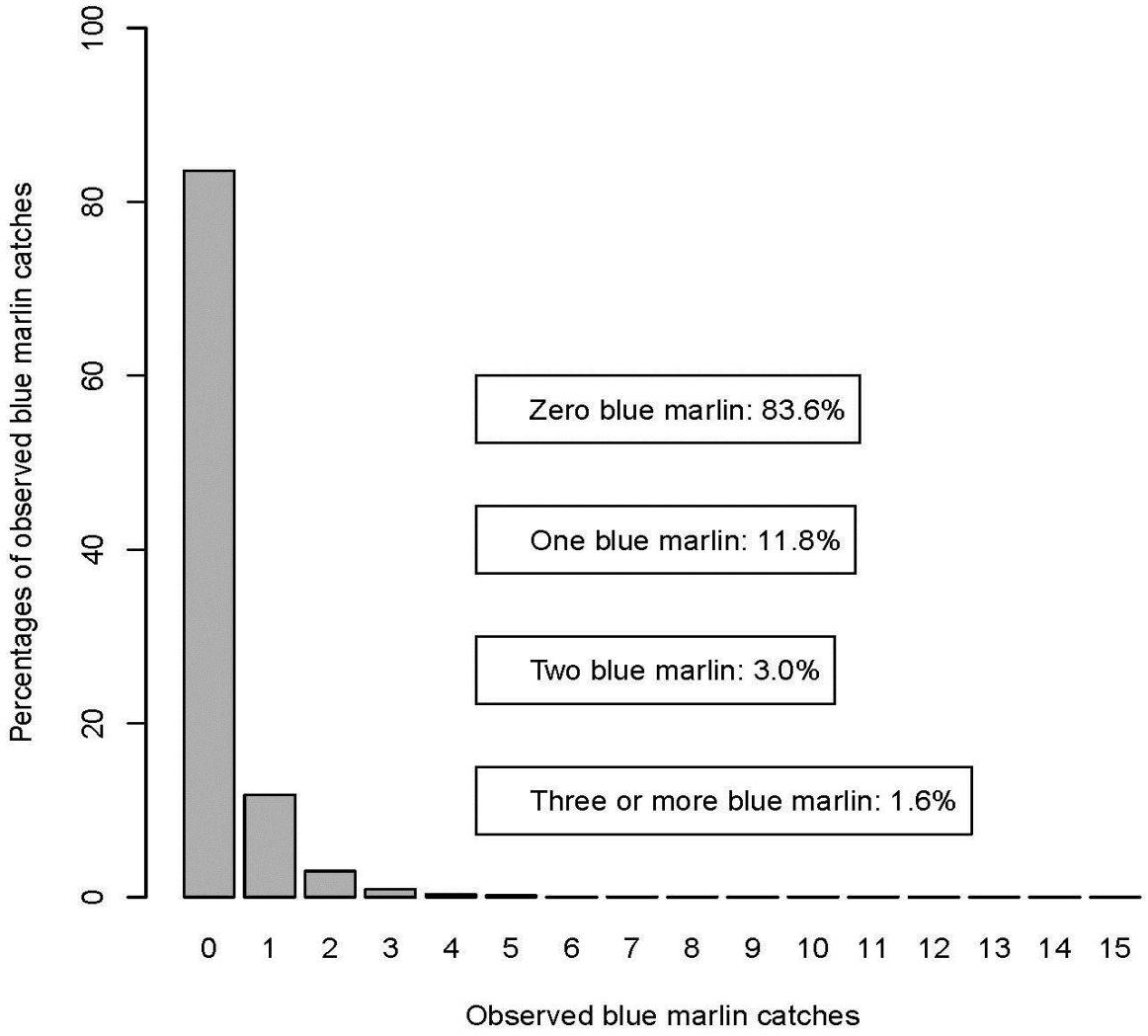
Model coefficients applied to logbook data (same predictors) → Possible outliers evaluated using regression techniques

Correction or replacement of errors → CPUE standardized with most accurate data

CPUE Standardization: Analytical Complexities

- Discontinuous time series in the shallow-set sector
- Catchabilities on longline gear may differ between targets and bycatch or incidentally caught species, making identification of explanatory variables difficult.
- Zero inflation often typical of catch data for bycatch or incidentally caught species.
- The geographic expanse of the fishery, typical operational procedures, and regulatory regime have changed during the last decade.

CPUE Standardization: Excess Zeros as Analytical Complexities



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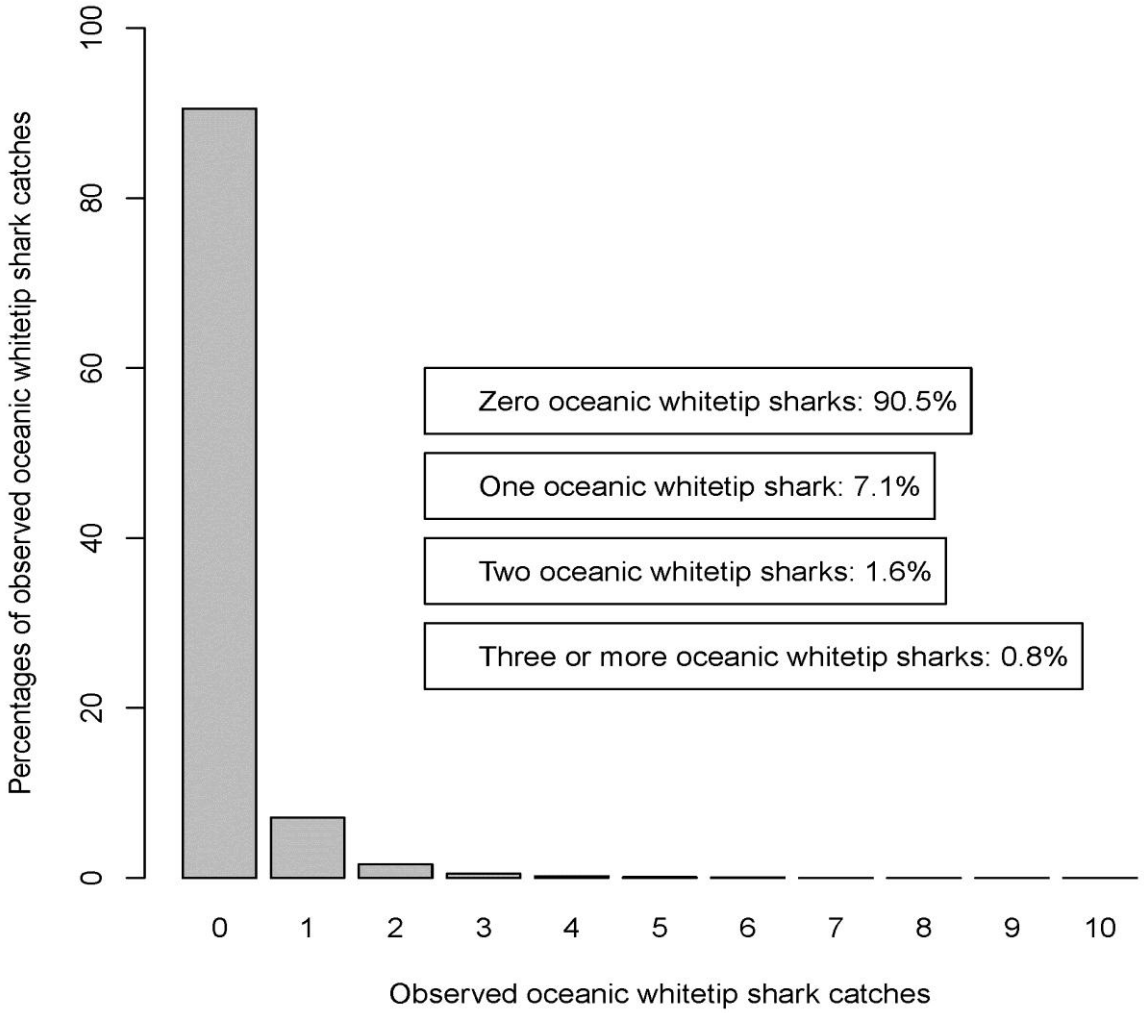


CPUE Standardizations: Strengths of these Analyses

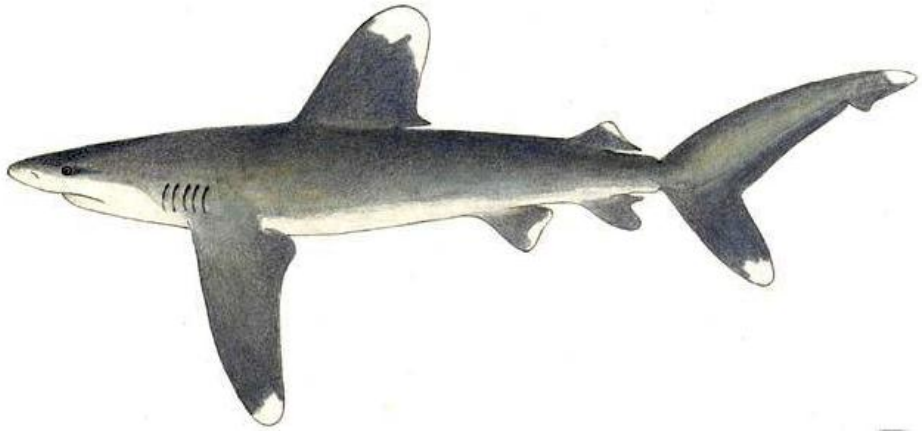
- **Multiple standardization models (e.g., delta-lognormal, delta-Gamma, Poisson, negative binomial, zero-inflated Poisson, zero-inflated negative binomial) developed and compared for fit using objective method (Akaike weights).**
- **Comparable results (i.e., high correlations and small angular deviations among CPUE trajectories) with several models indicate that findings are robust.**

Species of Interest: Completed Work with Sharks

Blue shark (*Prionace glauca*)

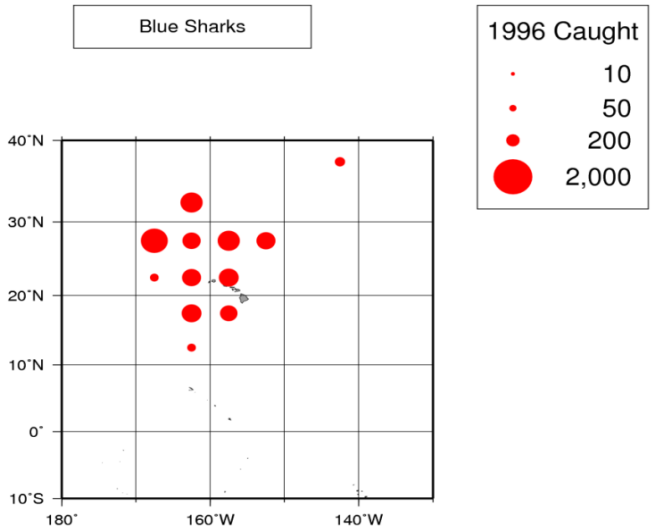
ISC stock assessment in progress; expected completion July 2013

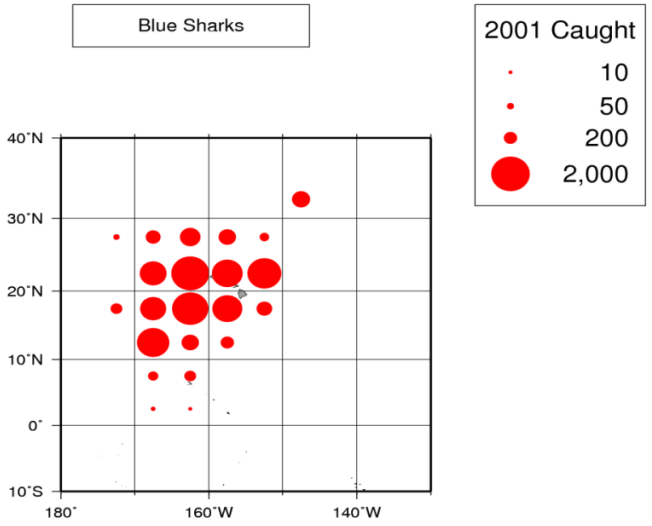
Oceanic whitetip shark (*Carcharhinus longimanus*)

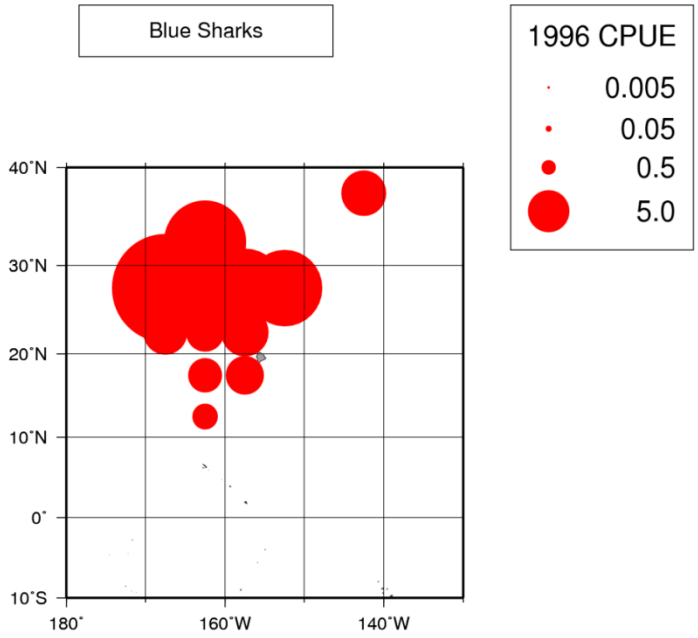


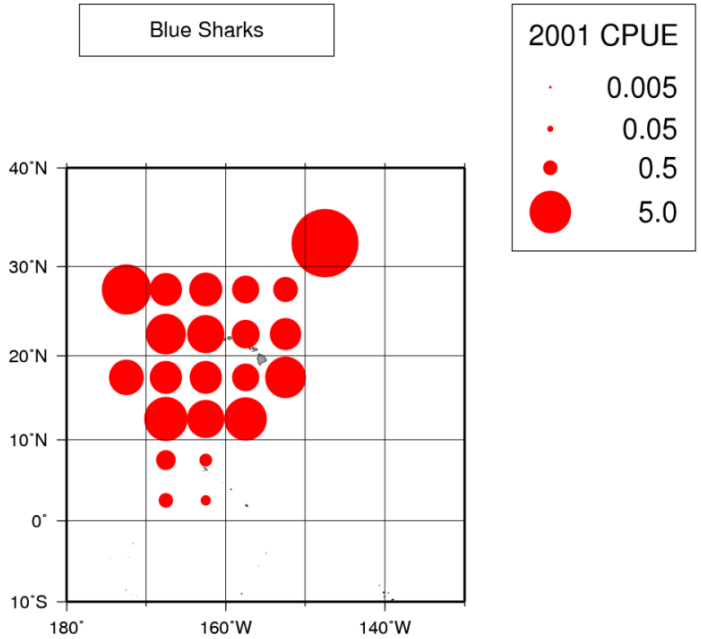
CPUE standardizations completed; zero-inflated negative binomial model selected by objective method

Analytical Complexities: Blue Shark Bycatch in a Changing Fishery

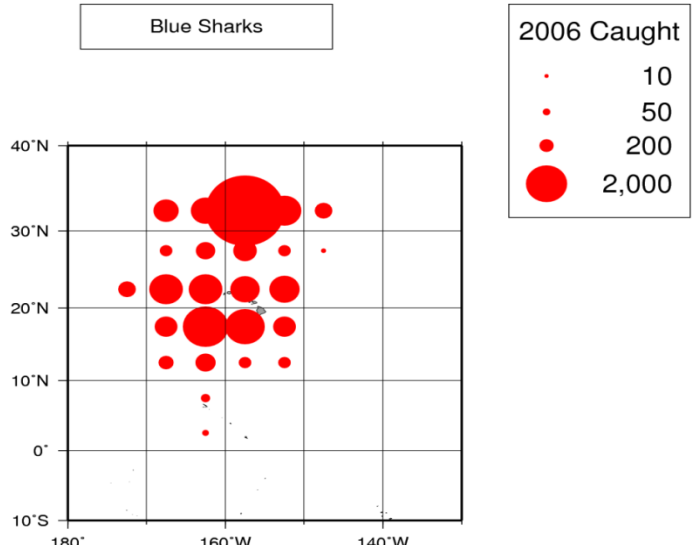


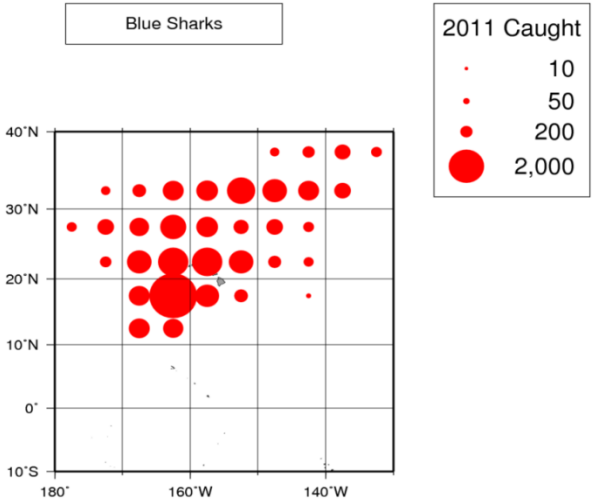


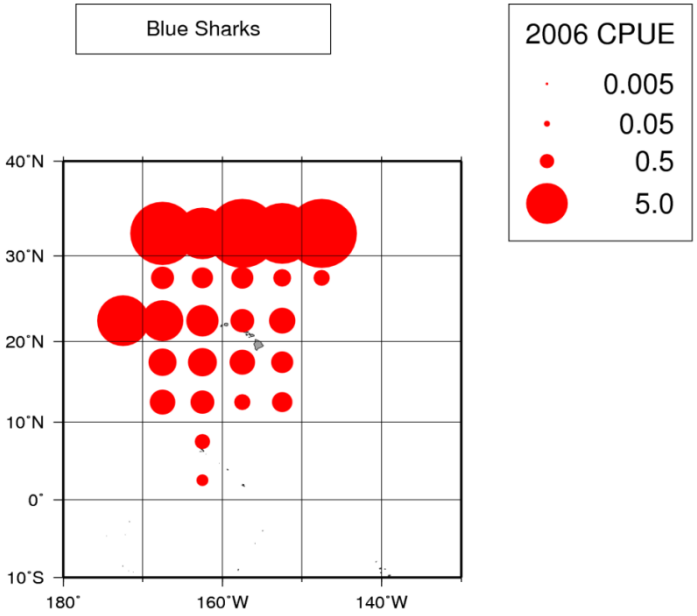


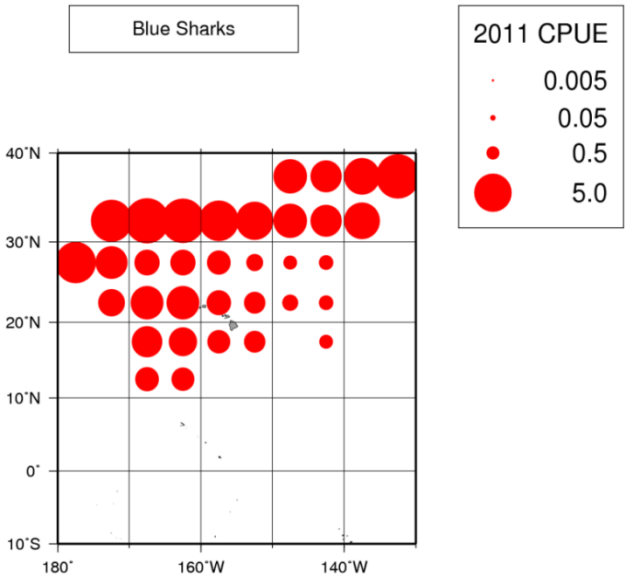


Analytical Complexities:
Blue Shark Bycatch in a Changing Fishery

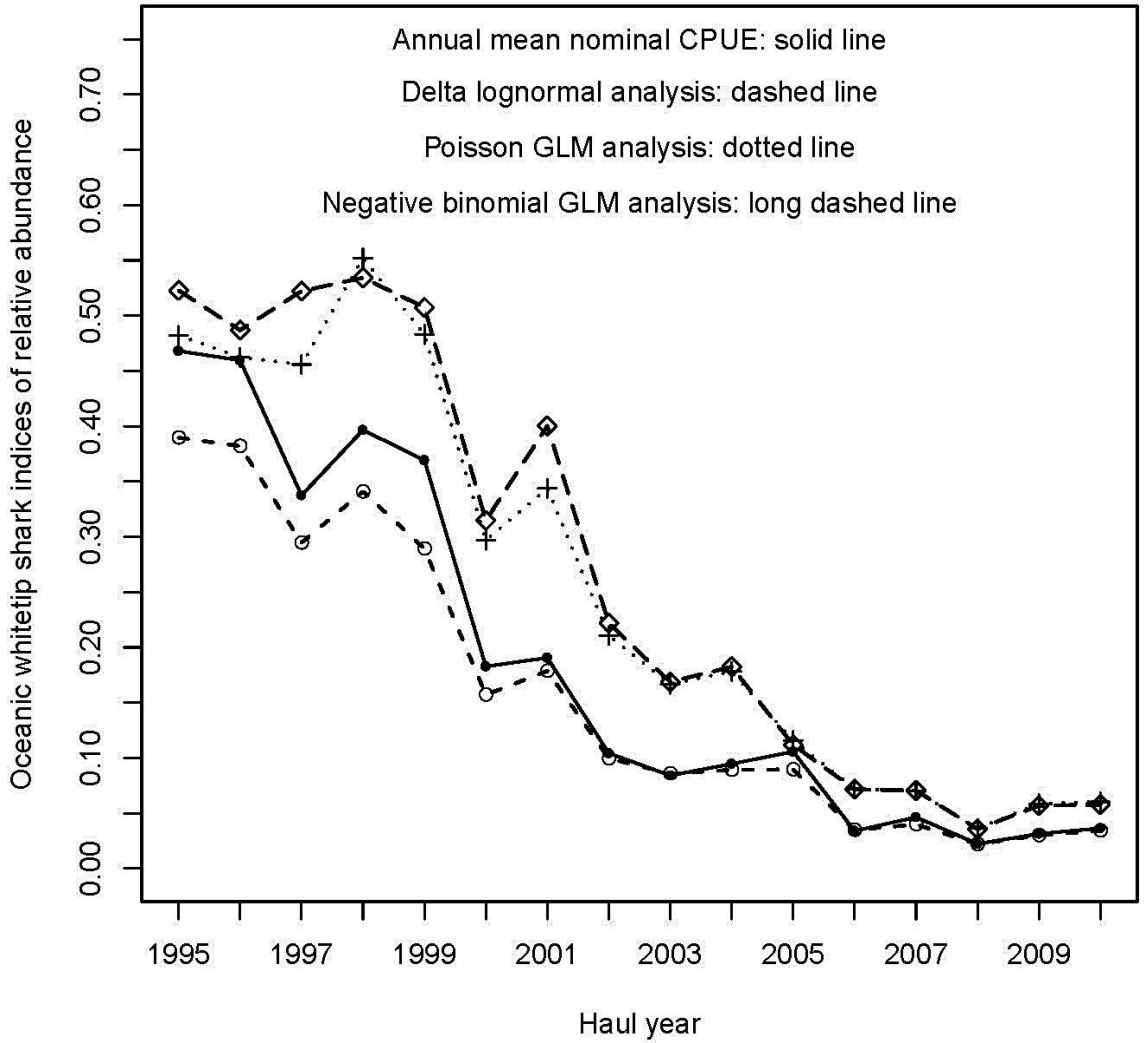








Species of Interest: Several CPUE Standardization Models Yield Consistent Trends with OWT Shark



Species of Interest:
Ongoing or Completed Work with Marlins

Blue marlin (*Makaira nigricans*)

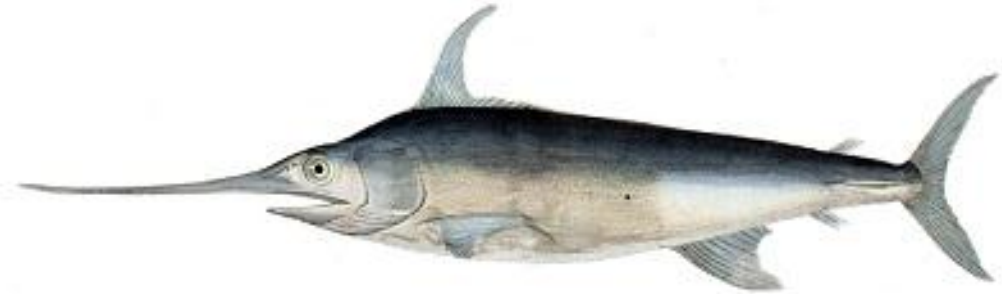
Comparative evaluation of zero-inflated and other CPUE standardization models is in progress. ISC stock assessment completed in May 2013.

Striped Marlin (*Kajikia audax*)

ISC stock assessment completed in July 2012. CPUE standardization favorably reviewed in December 2012.

Species of Interest:
Stock Assessment Work Scheduled for 2014

Swordfish
(***Xiphias gladius***)



The ISC BILLWG will conduct a swordfish stock assessment in 2014.

Shortfin mako
(***Isurus oxyrinchus***)

The ISC SHARKWG will conduct a shortfin mako stock assessment in 2014.

Conclusions

- **Data use procedures have proven useful for the stock assessments:**
- **Working papers submitted to the ISC SHARKWG and BILLWG included detailed data preparation procedures, analyses of deviance, model selection procedures, residuals plots, and other diagnostics.**
- **Documents exemplified "Best Available Science" standards.**
- **CPUE standardizations favorably reviewed.**